Proposed Action in this EIS would be consistent with a continuing U.S. moratorium or a Comprehensive Test Ban Treaty.

S.3 ALTERNATIVES

S.3.1 Pit Production Operational Requirements

This EIS analyzes the impacts from the construction and operation of a new facility, referred to as a MPF, to produce plutonium pits for nuclear weapons. In addition to the construction of a totally new facility, an option to upgrade the existing TA-55 Facility at the LANL to increase its output is analyzed as well as the No Action Alternative. This section discusses the overall pit production process, and lists the facility requirements necessary to accommodate this process. The MPF is in a conceptual design stage.

S.3.1.1 Pit Production Process

The following discussion is a brief summary of the pit production process that would be accomplished in a MPF. The overall process is depicted in Figure S.3.1.1–1 which shows three main areas: Material Receipt, Unpacking, & Storage; Feed Preparation; and Manufacturing.

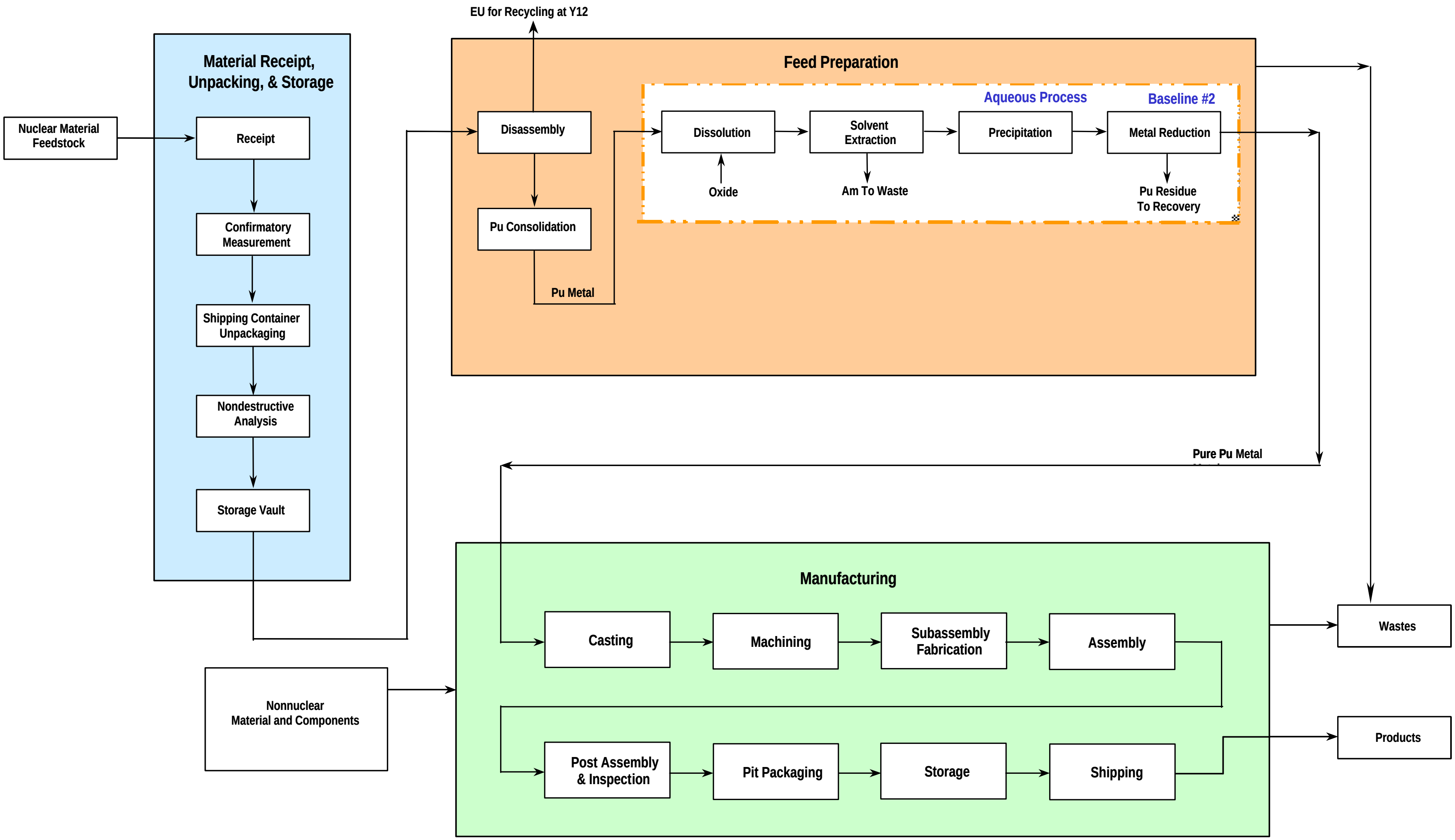
Material Receipt, Unpacking, & Storage

Plutonium feedstock material would be delivered from offsite sources in DOE/Department of Transportation (DOT) approved shipping containers, hauled by Safe Secure Trailers (SST) or Safeguards Transporters (SGT). The bulk of the feedstock material would be in the form of pits from old weapons to be recycled with small amounts of plutonium metals from LANL and SRS. Each shipment would be measured to confirm the plutonium content, entered into the facility’s Material Control & Accountability (MC&A) database, and placed into temporary storage. Containment vessels with the feedstock material would then be accountability measured and transferred to the Receipt Storage Vault pending transfer to the Feed Preparation Area.

Feed Preparation

The containers would then be transferred through a secure transfer corridor to an adjacent Feed Preparation Area where plutonium metal is prepared for manufacturing. For pits to be recycled, mechanical disassembly involves cutting the pit in half and removing all non-plutonium components. Notable among these non-plutonium components is enriched uranium, which would be decontaminated and then shipped to the Y-12 National Security Complex for recycling. All of the other disassembled components would be decontaminated to the maximum extent possible and then disposed of as either low level waste (LLW) or TRU waste as appropriate.

There are two baseline processes being evaluated for the purification of the plutonium metal. One baseline relies more heavily on aqueous chemistry (aqueous process) and the other on pyrochemical reactions (pyrochemical process). The primary difference between the two baselines is that the aqueous process does not employ chloride containing aqueous solutions, which means conventional stainless steels can readily be used to contain all of its processes. On the other hand the pyrochemical process requires specialized materials to contain the corrosive chloride bearing solutions that it employs.



Am = Americium.
EU = Enriched Uranium.
Pu = Plutonium.
Source: Modified from NNSA 2002.

Figure S.3.1.1–1. Modern Pit Facility Flow Process

The primary process evaluated in this EIS is the aqueous process. This is a well-known process that has been successfully used at DOE sites for many years. It is comparatively simple and experiences few, but well controlled corrosion problems. However, it is not as space efficient and does not produce as pure a product metal as the pyrochemical process. This lower purity requires more complete processing and historically the aqueous process produces significantly more waste than the pyrochemical process. This provides a bounding analysis of the waste impact from a MPF.

The pyrochemical process is more complex than the aqueous process, employing seven versus four major processing steps. However, this can be done in less space with more processing flexibility. It also produces very pure metal and a lower volume of waste. The purity of metal allows the pyrochemical process to have the option of only partially processing metallic plutonium to obtain adequate production purity. Although it requires special materials of construction to contain the corrosive chloride solutions it appears to have the greatest potential for improvement based on results from ongoing technology development projects. The pyrochemical process has been used for many years at LANL.

The pyrochemical process is being investigated because it has the potential to be environmentally more benign, thus having less environmental impact than the aqueous process. The impacts from both of these processes will therefore be bounded in this EIS. As the design of the MPF develops and a final purification method is chosen, the site-specific tiered-EIS will evaluate the impact of the actual process to be used.

Manufacturing

The plutonium metal resulting from the purification process would be transferred to the manufacturing area where it would be melted and cast into required shapes in a foundry operation. These castings would be machined to proper dimensions, combined with other non-plutonium parts, and assembled into pits. New pits would be inspected and prepared for storage and eventual shipment to Pantex.

S.3.1.2 Modern Pit Facility Requirements

Aside from the question of when a MPF would need to become operational, the question of design size of a MPF is next in importance. Design size would be primarily affected by both the operational lifetime of pits and the size of the stockpile. Since there is uncertainty over both these issues (see Section S.2), the final design size of a MPF has not yet been determined. These uncertainties have been evaluated in classified studies. Three levels of production are evaluated to provide a reasonable range for analysis in this MPF EIS. These are 125, 250, and 450 pits per year in a single-shift operation. To accommodate these three production rates, this EIS analyzes three different plant sizes. Another consideration is the contingency or surge use of two-shift operations for emergencies.

Security

The majority of the facilities of a MPF would be located within a Perimeter Intrusion Detection and Assessment System (PIDAS). The PIDAS is a multiple sensor system within a 9-m (30-ft) wide zone enclosed by two fences that surround the entire Security Protection Area. In addition, there would be 6-m (20-ft) clear zones on either side of the PIDAS. There would be an Entry Control Facility (ECF) at the entrance to the Security Protection Area.

Process Buildings

A proposed concept being evaluated for a MPF divides the major plant components into three separate process buildings identified as Material Receipt, Unpacking, & Storage; Feed Preparation; and Manufacturing. The process buildings would be two-story reinforced concrete structures located above ground at grade.

The first story of each building would include plutonium processing areas, manufacturing support areas, waste handling, control rooms, and support facilities for operations personnel. The second story of each of the three process buildings would include the heating, ventilating, and air conditioning (HVAC) supply fans, exhaust fans and high-efficiency particulate air (HEPA) filters, breathing/plant/instrument air compressor rooms, electrical rooms, process support equipment rooms, and miscellaneous support space. Each of these processing buildings would have its own ECF, truck loading docks, operations support facility, and safe havens designed in accordance with applicable safety and security requirements. The three process buildings would be connected with secure transfer corridors.

Support Buildings Within the Perimeter Intrusion Detection and Assessment System

The major support structures located within the PIDAS would include the Analytical Support Building and the Production Support Building. The Analytical Support Building would contain the laboratory equipment and instrumentation required to provide analytical chemistry and metallurgical support for the MPF processes, including radiological analyses. The Production Support Building would provide the capability for performing nonradiological classified work related to the development, testing, staging, and troubleshooting of MPF processes and equipment during operations. A number of other smaller structures also supporting the MPF would include the standby generator buildings, fuel and liquid gas storage tanks, HVAC chiller buildings, cooling towers, and the HVAC exhaust stack.

Support Buildings Outside the Perimeter Intrusion Detection and Assessment System

The major structures located outside the PIDAS would include the Engineering Support Building, the Commodities Warehouse, and the Waste Staging/TRU Packaging Building. This Waste Staging/TRU Packaging Building would be used for characterizing and certifying the TRU waste prior to packing and short-term lag storage prior to shipment to the TRU waste disposal site. Parking areas and stormwater detention basins would also be located outside the PIDAS. In addition, a temporary Concrete Batch Plant and Construction Laydown Area would be required during construction.

A generic layout showing the major buildings and their relationship to each other is shown in Figure S.3.1.2–1. Table S.3.1.2–1 shows the dimensions involved for the three different plant capacities.

Table S.3.1.2–1. Dimensions for the Three Different MPF Capacities

	125 ppy	250 ppy	450 ppy
Processing Buildings Footprint (m^2)	28,600	32,800	44,900
Support Buildings Footprint (m^2)	26,000	26,200	29,900
Total Buildings Footprint (m^2)	54,600	59,000	74,800
Total Buildings Footprint (ha)	5.46	5.90	7.48
Area inside PIDAS (ha)	25.5	26.3	31.6
Area Developed During Construction (ha)	56.3	58.3	69.2
Post Construction Developed Area (ha)	44.5	46.5	55.8

Source: MPF Data 2003.

S.3.1.3 Differences Between a Modern Pit Facility and the Rocky Flats Plant

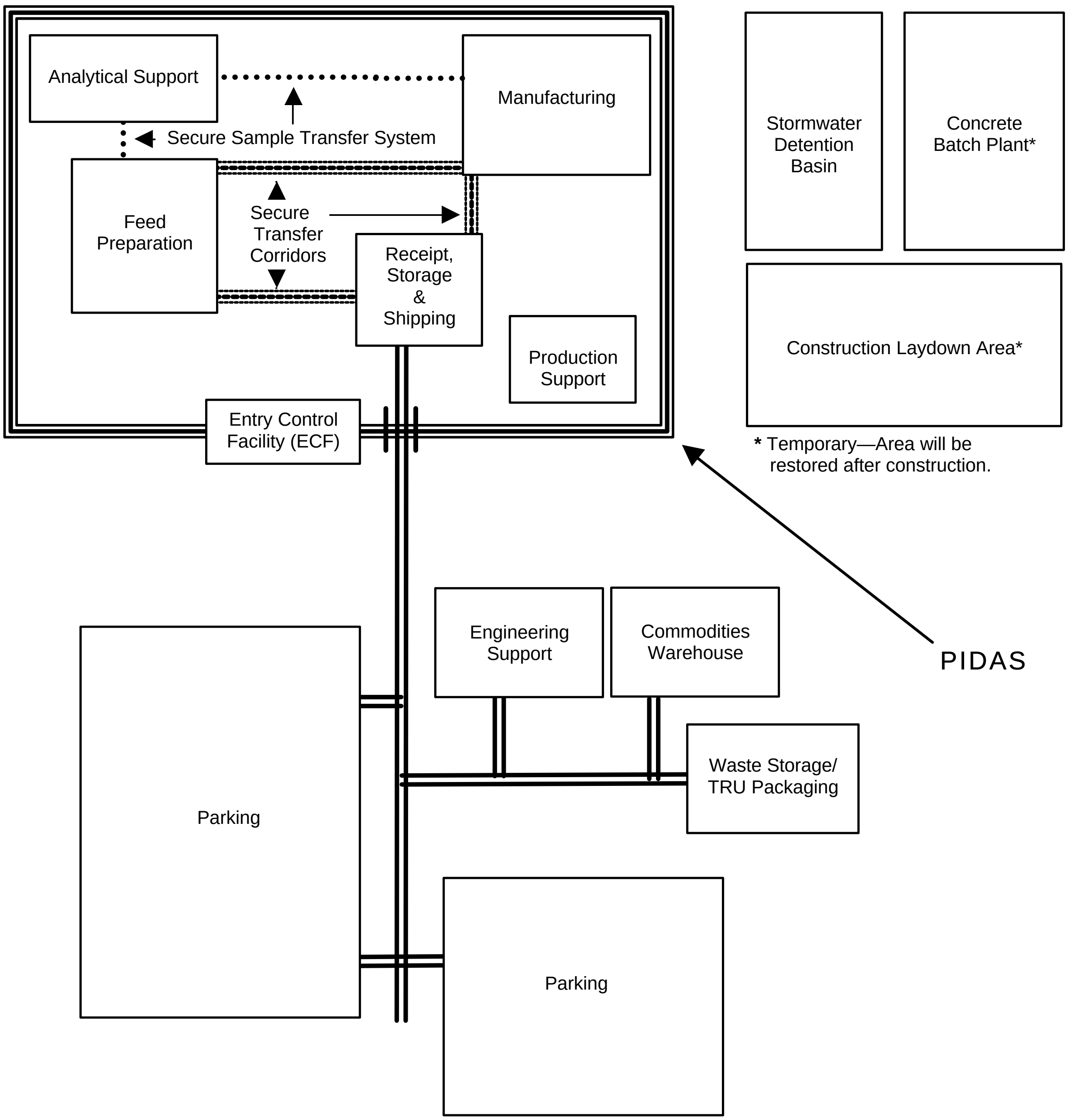
A MPF would be designed and operated to minimize risk to both workers and the general public during normal operations and in the event of an accident. Benefiting from decades of experience, the MPF would employ modern processes and manufacturing technologies and would utilize an oversight structure for safety, environmental protection, and management oversight that has been established since Rocky Flats ceased operations.

Building Design

Modern safety and security design standards of today require substantially different structures from the earlier pit manufacturing facilities at the Rocky Flats Plant, near Golden, Colorado. The buildings at the Rocky Flats Plant were constructed in the 1950s with metal roof sheeting covered by a built-up weather seal. In contrast, the exterior walls and roof of PF-4 (the current interim production plutonium machining facility at LANL) are constructed of reinforced concrete more than a foot thick. Internal walls at PF-4 are designed to provide multiple-hour fire barriers between wings. A MPF would be designed with similar improvements over practices at Rocky Flats.

Fire Control

Although DOE experienced accidents associated with the manufacture of plutonium pits, most of these accidents occurred in a relatively short time period (from 1966-1969) at the Rocky Flats Plant. The majority of these accidents involved plutonium metal and chips undergoing spontaneous ignition. Such events can occur when the environment they are in allows for the rapid oxidation of plutonium, often in association with a moist air environment. Efforts at Rocky Flats concentrated on the elimination of such fires. It is now recognized that potential for fire initiation cannot be totally eliminated. Although the frequency and severity of fires can be reduced through the management of combustible materials and facility design, such events are now anticipated and planned for in the structural and process design and operational procedures. Engineering monitoring systems would be activated if a fire occurs. These systems would activate controls and procedures to control, quickly suppress, and contain fires within the specific originating glovebox, minimizing the risk to workers and the general public.



Source: Modified from MPF Data 2003.

Figure S.3.1.2–1. Generic Layout of a Modern Pit Facility

Today, plutonium machining activities are conducted in gloveboxes supplied with an inert gas. Furthermore, gloveboxes are now equipped with exhaust filter systems. All working areas are separately vented with systems containing HEPA filters. These HEPA filters are fabricated of special nonflammable bonded material. Filter plenums are equipped with an automatic cooling system to reduce the temperature of the air reaching the final stages of HEPA filters. Unlike Rocky Flats, a MPF would have an automatic fire detection and suppression system designed to meet the latest National Fire Protection Association life safety codes and standards for manufacturing facilities. The design features would include multiple zones for both fire detection and suppression to assure that any fire which may occur would be isolated in small, separated areas of the facility, and thereby preclude the spread of fire to other separated areas or the entire building.

Waste Management and Material Control

A MPF would have a dedicated waste handling area capable of preparing waste for transport in accordance with established procedures and waste acceptance requirements. In addition, all waste streams to be generated by the MPF would have an established disposition path for each alternative being considered. Since the MPF EIS analyzes operations over a 50-year period, it is reasonable to expect that some disposition paths may change. A MPF would utilize a stringent Material Control and Accountability System to accurately account for all special nuclear material.

S.3.1.4 TA-55 Upgrade Facility Requirements

The TA-55 Upgrade Alternative (80 ppy) would involve expanding the current pit production capabilities of plutonium facilities in Building PF-4 up to approximately 80 pits per year without expanding the size of the building. To do this, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or downsized and consolidated within PF-4. Material characterization and chemical analyses would be performed at another LANL facility.

The TA-55 Upgrade Alternative differs from a MPF in several important aspects that derive from upgrading existing facilities. First, a production level of only 80 ppy is the maximum deemed feasible and is used in this analysis. Next, the MPF design life of 50 years may not be achievable by a facility that will have already operated about 40 years before achieving these increased production levels. Since equipment for feed material preparation, recovery of metal from scrap, and waste processing already exist in this building, feed preparation will use the pyrochemical process to purify material in conjunction with aqueous processing of recoverable residues.

Additionally, all production functions—Receipt and Storage, Feed Preparation, Manufacturing, and Analytical Support—will be performed within a single PIDAS at TA-55 in buildings connected by secure transfer corridors. Feed preparation and manufacturing will be performed in PF-4 and analytical support functions will be performed at another LANL facility. PF-4 will be upgraded as appropriate to perform required material receipt and storage functions.

PF-4 Alterations

Additional space for pit manufacturing would be obtained by expanding into laboratory space currently used for processing operations that are unrelated to pit manufacturing. In this option, these activities would have to be relocated to another facility or downsized/consolidated (with a subsequent reduction of capacity) and the vacated space used for pit manufacturing support. The affected activities include analytical chemistry and materials characterization (AC and MC) operations. Approximately 511 m^2 (5,500 ft^2) of floorspace would be realized by moving the AC and MC operations out of PF-4.

Modifications to the facility would include major upgrades to the residue recovery/metal feed facilities in the 400 Area of PF-4. Many of the gloveboxes in this part of the facility would have to be replaced. Replacement of these older gloveboxes would be required to ensure that the recovery/feed process operations are adequate to supply plutonium metal to the manufacturing operations. There would also be significant glovebox decontamination/decommissioning/ disposal operations as new process development and certification operations are moved into other areas of PF-4. In addition, various manufacturing equipment will be added to or replaced in the fabrication areas of PF-4 to increase capacity and reliability.

To obtain the required space in PF-4 and to expand the pit manufacturing production to greater than 20 pits per year, consolidation of plutonium-238 operations and relocation of plutonium-239 oxide characterization operations within the facility would be necessary. Consolidation of plutonium-238 operations from approximately 790 m^2 (8,500 ft^2) to about 641 m^2 (6,900 ft^2) of laboratory space would reduce the capacity, but not eliminate the capability, for heat source fabrication. Additional space could be obtained by moving some plutonium-239 oxide characterization operations (214 m^2 [2,300 ft^2]) from one laboratory to the upgraded 400 Area and by acquiring space from some programs that would be completed in the 2015 to 2020 timeframe when space is needed for expanding pit production capacities.

Support Facilities

Modifications to existing facilities at TA-55 would be to accommodate additional workers employed in pit manufacturing. As the capacity of the pit fabrication operations is increased, the plant ingress/egress requirement for plutonium workers also increases. This results in the need for additional space for the increased access/egress as well as additional change rooms. New engineering support facilities containing a cold (nonradiological) laboratory, additional office space, and a warehouse for receipt and storage of nonradioactive materials and parts would have to be constructed. The cold laboratory is needed for cold process development, staging, training, and as space for uncleared workers. Office space at TA-55 is currently oversubscribed and increasing the pit fabrication capacity would require additional space.

The Radioactive Liquid Waste Treatment Facility (TA-50) and the Solid Waste Management Facility (TA-54) would be capable of processing the waste streams from PF-4 even with the enhanced fabrication mission of 80 ppy. A small glovebox decontamination/handling facility at TA-54 that is specifically designed to prepare decommissioned gloveboxes for shipment to the Waste Isolation Pilot Plant as TRU waste or burial as low-level waste would be required. This facility is required because the modifications in this alternative would entail the removal of approximately 140 gloveboxes over the course of about 10 years. The new decontamination/handling facility would perform decontamination, size-reduction, packaging, and/or other activities necessary to satisfy the waste acceptance or burial criteria.

The construction of these new facilities would result in an addition of approximately 1.0 ha (2.5 ac) to the permanent TA-55 footprint with 2.5 ha (6.2 ac) total area disturbed during construction. The actual removal of the gloveboxes from PF-4 and decontamination/ decommissioning are not included as part of the construction process, and the workers and waste resulting from these activities are not included in the construction data presented in Section 3.1.4.3 of this EIS. Because the removal of the approximately 140 gloveboxes would take place over a 10-year period, the requirements and wastes from the activity are included with the operational values.

S.3.2 Development of Reasonable Alternatives and Environmental Impact Statement Scope

S.3.2.1 Planning Assumptions and Basis for Analysis

This MPF EIS evaluates reasonable alternatives in order to decide: (1) whether to proceed with construction and operation of a MPF; and (2) if so, where to locate a MPF. Five alternatives are evaluated for a new MPF: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site, (3) Carlsbad Site, New Mexico; (4) Savannah River Site, South Carolina; and (5) Pantex Site, Texas. For the five MPF site alternatives, the EIS evaluates the environmental impacts associated with constructing and operating the MPF to produce sufficient quantities of plutonium pits to support the U.S. nuclear stockpile. In addition, the EIS evaluates the environmental impacts associated with expanding operations at TA-55 while upgrading the existing TA-55 facilities (TA-55 Upgrade Alternative). Some of the more specific assumptions and considerations that form the basis of the analyses and impact assessments that are the subject of this EIS are presented below.

- As required by the Council on Environmental Quality (CEQ) regulations, the MPF EIS evaluates a No Action Alternative. The No Action Alternative would utilize the capabilities currently being established at LANL for interim capacity to meet the Nation's long-term needs for pit manufacturing. Under the No Action Alternative, NNSA would not proceed with a MPF, which might limit the ability to maintain, long-term, the nuclear deterrent that is a cornerstone of U.S. national security policy. In previous NEPA documents (the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, DOE/EIS-0236 and the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, DOE/EIS-0238 [LANL SWEIS]), DOE evaluated the environmental impacts associated with producing up to 50-80 ppy at LANL; however, the ROD for the LANL SWEIS limited production to 20 ppy. Thus, under the MPF EIS No Action Alternative, NNSA could produce up to 20 ppy for the foreseeable future.
- In the LANL SWEIS, DOE committed to provide appropriate NEPA review to implement manufacturing capacity beyond 20 ppy. This MPF EIS provides NEPA coverage for nominal pit production up to approximately 80 ppy at LANL under the TA-55 Upgrade Alternative. Construction activities (primarily the addition of office space) associated with